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**United States Patent** [19][11] **Patent Number:** **5,257,970****Dougherty**[45] **Date of Patent:** **Nov. 2, 1993**[54] **IN SITU PHOTODYNAMIC THERAPY**[75] **Inventor:** **Thomas J. Dougherty**, Grand Island, N.Y.[73] **Assignee:** **Health Research, Inc.**, Buffalo, N.Y.[21] **Appl. No.:** **865,918**[22] **Filed:** **Apr. 9, 1992**[51] **Int. Cl.<sup>5</sup>** ..... **A61N 1/30**[52] **U.S. Cl.** ..... **604/20; 604/49; 424/450; 540/145**[58] **Field of Search** ..... **604/20, 21, 49; 128/898; 424/450; 540/145**[56] **References Cited****U.S. PATENT DOCUMENTS**

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[57] **ABSTRACT**

The process of photodynamic therapy (PDT) is conducted by the step of:

- 1) separately encapsulating at least one activation component for said photodynamic therapy process in a liposome;
- 2) injecting a photosensitizer into a human or animal host;
- 3) injecting the liposome encapsulated components systemically into the same human or animal host; and
- 4) heating the site of the tumor to melt the liposome encapsulated components to permit mixing of the activation components.

The mixing of the activation components can result in:

- a) energy transfer to the previously injected photosensitizer;
- b) emission of light and absorption of said light by the previously injected photosensitizer; and
- c) direct formation of at least one cytotoxic species that functions against the tumor.

The heating of the site of the tumor is accomplished by one of the following methods: laser, ultra sound, radio-frequency or microwave frequency. Photofrin photosensitizer is a preferred photosensitizer.

**9 Claims, No Drawings**